

- 1 1. A in-line expansion tank, comprising:
2 a pressure assembly having first and second passage fittings providing fluidic
3 communication between an interior and an exterior of the pressure
4 assembly;
5 first and second collars sealingly connected to the first and second passage
6 fittings, respectively;
7 a resilient diaphragm having first and second ends, wherein the first and second
8 ends are sealingly connected to an exterior of the first and second collars,
9 respectively; and
10 a tube retained between the first and second collars and having two ends, wherein
11 one or both ends have a notch providing fluidic communication between
12 an interior of the tube and an interior of the diaphragm.
- 13 2. The in-line expansion tank of claim 1, further comprising a valve providing
14 controllable fluidic communication between an exterior of the tank and a space
15 between the pressure assembly and the diaphragm.
- 16 3. The in-line expansion tank of claim 2, wherein the pressure assembly is metallic
17 and comprises a shell having first and second ends and first and second domes
18 welded to the first and second ends of the shell, respectively, wherein the first and
19 second passage fittings are disposed in a wall of the first and second domes,
20 respectively, and wherein the valve is disposed in a wall of one of the domes or of
21 the shell
- 22 4. The in-line expansion tank of claim 2, wherein the pressure assembly is metallic
23 and comprises first and second domes welded to one another, wherein the first
24 and second passage fittings are disposed in a wall of the first and second domes,
25 respectively, and wherein the valve is disposed in a wall of one of the domes.

- 1 5. The in-line expansion tank of claim 1, wherein a cross-sectional area of the first
2 and second ends of the diaphragm is smaller than a cross-sectional area of a
3 middle portion of the diaphragm.
- 4 6. The in-line expansion tank of claim 1, wherein a portion of at least one of said
5 collars has an outer diameter that is approximately equal to an inner diameter of
6 said diaphragm.
- 7 7. The in-line expansion tank of claim 1, wherein one or both of the ends of the tube
8 have a plurality of notches.
- 9 8. The in-line expansion tank of claim 1, wherein at least a middle portion of the
10 diaphragm is configured to contact the tube at normal operating pressures.
- 11 9. An in-line expansion tank, comprising:
12 a pressure assembly having an inlet and an outlet;
13 a flow-through assembly having an interior and an exterior and first and second
14 ends sealingly connected to the inlet and outlet, respectively; and
15 a resilient diaphragm having a middle portion and first and second ends sealingly
16 connected to the flow-through assembly, wherein
17 the cross-sectional area of the first and second ends of the diaphragm are smaller
18 than a cross-sectional area of the middle portion, and
19 a space between the exterior of the flow-through assembly and the interior of the
20 diaphragm is in fluidic communication with the interior of the flow-
21 through assembly.
- 22 10. The in-line expansion tank of claim 9, wherein the pressure assembly is metallic
23 and comprises a shell having two ends and first and second domes welded to the
24 shell, wherein the inlet and the outlet each comprise a passage fitting disposed in
25 a wall of one of the domes.
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- 1 11. The in-line expansion tank of claim 10, further comprising a valve providing
2 controllable fluidic communication between an exterior of the tank and a space
3 between the pressure assembly and the diaphragm, wherein the valve is disposed
4 in a wall of the shell or of one of the domes.
- 5 12. The in-line expansion tank of claim 9, wherein the pressure assembly is metallic
6 and comprises first and second domes welded to one another, wherein the inlet
7 and the outlet each comprise a passage fitting disposed in a wall of one of the
8 domes.
- 9 13. The in-line expansion tank of claim 12, further comprising a valve providing
10 controllable fluidic communication between an exterior of the tank and a space
11 between the pressure assembly and the diaphragm, wherein the valve is disposed
12 in a wall of one of the domes.
- 13 14. The in-line expansion tank of claim 9, wherein at least a middle portion of the
14 diaphragm is configured to contact the tube at normal operating pressures.
- 15 15. The in-line expansion tank of claim 9, wherein the flow-through assembly
16 comprises:
17 first and second collars sealingly connected to the inlet and outlet, respectively;
18 and
19 a tube retained between the first and second collars and having two ends, wherein
20 one or both ends has a notch providing fluidic communication between an
21 interior of the tube and an interior of the diaphragm.
- 22 16. The in-line expansion tank of claim 15, wherein one or both of the ends of the
23 tube have a plurality of notches.
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- 1 17. An in-line expansion tank, comprising:
2 a metallic pressure assembly, comprising:
3 first and second domes joined to form a chamber by a welded joint; and
4 first and second fittings attached to the first and second domes,
5 respectively, and adapted and constructed for connection to a
6 plumbing system and providing fluidic communication between an
7 interior and an exterior of the pressure assembly;
8 a flow-through assembly having an interior and an exterior and first and second
9 ends sealingly connected to the first and second fittings, respectively; and
10 a resilient diaphragm having inlet and outlet ends sealingly connected to the flow-
11 through assembly, wherein a space between the exterior of the flow-
12 through assembly and the interior of the diaphragm are in fluidic
13 communication.
- 14 18. The in-line expansion tank of claim 17, further comprising a valve providing
15 controllable fluidic communication between an exterior of the tank and a space
16 between the metallic pressure assembly and the diaphragm, wherein the valve is
17 disposed in a wall of one of the domes.
- 18 19. The in-line expansion tank of claim 17, further comprising a shell having first and
19 second ends, wherein the first and second domes are welded to the first and
20 second ends of the shell to form the chamber.
- 21 20. The in-line expansion tank of claim 18, further comprising a valve providing
22 controllable fluidic communication between an exterior of the tank and a space
23 between the metallic pressure assembly and the diaphragm, wherein the valve is
24 disposed in a wall of the shell or of one of the domes.
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- 1 21. The in-line expansion tank of claim 17, wherein the flow-through assembly
2 comprises:
3 first and second collars sealingly connected to the first and second domes,
4 respectively; and
5 a tube retained between the first and second collars and having two ends, wherein
6 one or both ends has a notch providing fluidic communication between an
7 interior of the tube and an interior of the diaphragm.
- 8 22. The in-line expansion tank of claim 21, wherein one or both of the ends of the
9 tube have a plurality of notches.
- 10 23. The in-line expansion tank of claim 17, wherein a cross-sectional area of the first
11 and second ends of the diaphragm is smaller than a cross-sectional area of a
12 middle portion of the diaphragm.
- 13 24. The in-line expansion tank of claim 21, wherein a portion of at least one of said
14 collars has an outer diameter that is approximately equal to an inner diameter of
15 said diaphragm.
- 16 25. The in-line expansion tank of claim 21, wherein a diameter of the diaphragm is
17 substantially uniform along the diaphragm's length and greater than a diameter of
18 the tube.
- 19 26. The in-line expansion tank of claim 17, wherein at least a middle portion of the
20 diaphragm is configured to contact the tube at normal operating pressures.
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- 1 27. A preassembled water chamber assembly for an expansion tank, comprising:
2 a tube having first and second ends;
3 first and second collars disposed at the first and second ends of the tube,
4 respectively; and
5 a resilient diaphragm having first and second ends, the diaphragm disposed about
6 the tube and the first and second ends of the diaphragm sealingly fitted
7 around the first and second collars, respectively.
- 8 28. The water chamber assembly of claim 27, wherein a cross-sectional area of the
9 first and second ends of the diaphragm is smaller than a cross-sectional area of a
10 middle portion of the diaphragm.
- 11 29. The water chamber assembly of claim 27, wherein a portion of at least one of said
12 collars has an outer diameter that is approximately equal to an inner diameter of
13 said diaphragm.
- 14 30. The water chamber assembly of claim 27, wherein one or both ends of the tube
15 has at least one notch.
- 16 31. The water chamber assembly of claim 30, wherein one or both of the ends of the
17 tube have a plurality of notches.